

## Materials Science

EFFECTS OF QUENCHING MEDIUM AND ANNEALING RATE ON THE MAGNETOELASTIC PROPERTIES OF D-2 STEEL, James Matthew Kerr, Daniel K. Pratt, and Mark S. Boley\*, Department of Physics, Western Illinois University, Macomb, IL 61455, MS-Boley@wiu.edu

Previously, I have found that the 12% chromium highly wear-resistant tool steel, D-2, is an excellent candidate for long-term torque sensing applications such as those in the automotive industry. Its torque load sensitivity and magnetic hysteresis properties were found to slightly improve subsequent to a water quench and a standard annealing and cooling rate. My more recent work has focused on producing identical sensory shafts and subjecting them to different cooling rates in their annealing process, as well as investigating the effects of an oil quench rather than a water quench. In each case, torque load sensitivities and magnetic hysteresis properties have been measured both before and after the quench and annealing of the samples. The results I have obtained suggest that the quenching medium and cooling rate are crucial to the enhancement of the torque sensory function and the magnetoelastic properties of the steel, and also result in significant changes in the magnetic hysteresis behavior. The best performance was found for samples that were oil quenched at the most rapid annealing rate.